

SCIENTIFIC REPORT

Postoperative endophthalmitis associated with sutured versus unsutured clear corneal cataract incisions

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Aim: To compare the incidence of postoperative endophthalmitis in clear corneal cataract surgeries performed with and without suture closure, antibiotics and povidone iodine.

Setting: Ambulatory surgery facility.

Methods: In a retrospective, consecutive case-series study, we reviewed the incidence of endophthalmitis in 815 consecutive eyes that underwent cataract surgery by a single surgeon over a 5-year period (379 unsutured and 436 sutured, 294 without and 521 with antibiotic drops in the immediate postoperative period, and 247 without and 568 with povidone iodine before patching).

Results: There were five cases of culture-positive postoperative endophthalmitis in the unsutured group and none in the sutured group ($p=0.022$). Although patients in these two groups received routine preoperative antibiotic and povidone-iodine drops, those in whom antibiotic eye drops were not initiated until the day after surgery ($p=0.006$) and those who did not receive 5% povidone-iodine drops immediately after wound closure ($p=0.031$), had a higher incidence of endophthalmitis.

Conclusion: Results suggest that by suturing the corneal incisions, by initiating antibiotic eye drops within the first 24 h of surgery and by instilling povidone-iodine drops after closure, the incidence of endophthalmitis after cataract surgery could possibly be reduced.

Since the clear corneal, self-sealing cataract incision was introduced in 1992,¹ there have been numerous reports suggesting an increase in the incidence of postoperative endophthalmitis. A literature review by Taban *et al*² reported an increase in the frequency of endophthalmitis coinciding with the development of sutureless clear corneal temporal incisions.² Our study reviews five cases of endophthalmitis that occurred after cataract surgery in a consecutive series over a 5-year period.

MATERIALS AND METHODS

We reviewed the incidence and details of cases with endophthalmitis from 1 January 2001 to 31 December 2005 among 815 consecutive cases of clear corneal temporal-incision cataract surgeries performed by a single experienced cataract surgeon (SST) at the same ambulatory surgery facility.

All 815 eyes received packaged lid scrubs for three nights before surgery and antibiotic eye drops, 4 times a day, for 3 days before surgery (ofloxacin in 445 eyes, tobramycin in 57 and moxifloxacin in 313). Ofloxacin and tobramycin were used before April 2004, whereas moxifloxacin was used after April 2004. All patients, except for 10 who were allergic to iodine, received 5% povidone-iodine solution on the conjunctiva as part of the preoperative preparation at the time of surgery. In addition, one drop of 5% povidone iodine was administered in 568 of the 815 cases at completion of surgery. All patients

received an antibiotic drop and/or an ointment after removal of the lid speculum and before patching. In 521 cases, antibiotic drops were initiated on the afternoon of surgery, whereas in 294 cases it did not begin until the day after surgery. The postoperative antibiotic was same as the one that was used preoperatively. Three-plane corneal incisions were made just inside the temporal limbus with either a 2.75 or 3.00 mm Alcon disposable keratome (Alcon Laboratories Inc, Fort Worth, Texas, USA). All patients received an Alcon Acrysof lens (SA30, SA60, MA60, SN60). In 74 eyes, the lens was inserted with folding forceps. In 741 eyes, the lens was inserted using a cartridge. A total of 436 eyes received a single 10–0 nylon suture across the temporal incision, whereas 379 received no suture. Before September 2003, a suture was placed if the wound had leakage with depression of the posterior lip after wound edge hydration. After September 2003, all incisions received a single 10–0 nylon suture. In all, 735 cases were performed under topical anaesthesia (67 with peribulbar, 12 with retrobulbar) and one under general anaesthesia.

Pars plana vitreous taps were performed in all patients with endophthalmitis for obtaining cultures and for injecting intravitreal ceftazidime and vancomycin. Concurrent intravitreal dexamethasone was also given in three of the five cases. Comparison of the incidence of endophthalmitis between various clinical subcategories of the patients was performed using two-sided Fisher's exact tests.

RESULTS

Of the patients, 333 (484 eyes) were females and 190 (331 eyes) were males. There were five cases of culture-positive endophthalmitis, all of which responded to intravitreal, subconjunctival and topical antibiotic treatment. Table 1 summarises the clinical details of each case. Time from surgery to presentation of symptoms (pain and decreased vision) ranged from 3 to 8 days. Clinical signs at the time of presentation consisted of intense conjunctival injection and ciliary flush, as well as fibrinous exudation, increased inflammatory cells and hypopyon. Vitreous cultures grew coagulase-negative *Staphylococcus* in four cases and coagulase-positive *Staphylococcus* in one case.

All cases of endophthalmitis were reported from the unsutured group and none was from the sutured group ($p=0.022$). No case of endophthalmitis was associated with intraoperative capsular tear or vitreous loss. In all five cases, the foldable intraocular lens was injected into the eye using a cartridge. Water-tightness of the wound was confirmed in each case with a provocative Seidel test and no wound leak was evident on the first postoperative day. All cases of endophthalmitis had topical anaesthesia.

All five cases received povidone iodine at the beginning of the surgery. One patient received it at the completion of the procedure (table 2; $p=0.031$). All five patients did not have antibiotic eye drops (ofloxacin) given until the morning after surgery ($p=0.006$).

Table 1 Clinical details of patients with endophthalmitis

Case no	Age (years)/sex	Days of presentation after surgery*	Organism	Treatment	Final BCVA
1	62/F	3	Coagulase-negative <i>Staphylococcus</i>	Intravit Abx	20/20
2	77/F	8	Coagulase-negative <i>Staphylococcus</i>	Intravit Abx and corticoster	20/30
3†	77/M	6	Coagulase-negative <i>Staphylococcus</i>	Intravit Abx	20/25
4	80/F	3	Coagulase-negative <i>Staphylococcus</i>	Intravit Abx and corticoster	20/25
5	81/M	4	Coagulase-positive <i>Staphylococcus</i>	Intravit Abx and corticoster	20/60

Abx, antibiotics; BCVA, best-corrected visual acuity; corticoster, corticosteroids; F, female; Intravit, intravitreal; M, Male.

*With pain and reduced vision.

†With diabetes.

DISCUSSION

There have been reports in the recent literature that the sutureless clear corneal cataract incision could allow bacteria from the tears and conjunctiva to enter the eye during the first few postoperative hours, leading to an increased frequency of endophthalmitis.²⁻⁶ *In vitro* studies showed an inflow of India Ink through an unsutured cataract incision at low intraocular pressure.^{3,4} Herretes *et al*⁵ observed inflow of extraocular fluid through a cataract incision after hydrosealing (stromal hydration with intrastromal injection of balanced-salt solution) of wounds in their patients. In their prospective randomised study, Nagaki *et al*⁶ reported a significantly higher incidence of endophthalmitis with unsutured clear corneal temporal incisions when compared with unsutured superior sclerocorneal incisions covered with conjunctiva. For clear corneal incisions, it seems that the wound construction would play a major role. If the wound seals well, the risk of fluid inflow would be expected to be lower. Maxwell and Diamond⁷ reported that nearly 80% of 25 consecutive cases of endophthalmitis had wound defects.

The source of the bacteria in most cases of endophthalmitis is the patient's own flora,⁸ with coagulase-negative *Staphylococcus* being the most common pathogen.⁹⁻¹¹ Although the benefit of short-term preoperative antibiotics has not yet been proven, reducing the bacteria count on the conjunctiva could, theoretically, be helpful in preventing postoperative infection. Chronic, long-term antibiotics, on the other hand, could be counterproductive by promoting resistant organisms. Preoperative application of povidone iodine to the conjunctiva has been reported to reduce the bacterial flora of the conjunctiva and to be associated with a decreased risk of endophthalmitis.^{8,12,13} Now that the intraocular lens can be inserted using a cartridge, thus avoiding its direct contact with the conjunctiva, the amount of bacterial inoculum introduced into the eye at the time of surgery could possibly be reduced. If the inflow of extraocular fluid through a fresh postoperative

incision is possible, then maintaining a low bacteria count on the ocular surface during the immediate postoperative period is important. This would suggest, in turn, that vigorous short-term antibiotic treatment in the immediate postoperative period could be beneficial. Colleaux and Hamilton¹⁴ reported a significantly decreased incidence of endophthalmitis with the administration of subconjunctival antibiotics at the conclusion of cataract surgery. Wallin *et al*¹⁵ reported a statistically significant association between endophthalmitis and initiation of antibiotics on the day after surgery. If no suture is used, then meticulous wound construction must result in a water-tight wound with no gape. A longer, bevelled tunnel incision with adequate hydrosealing of the incision would seem helpful in maintaining a secure wound. A wound leak on the first postoperative day is a significant risk factor for endophthalmitis.¹⁵ Whether increased eye movement and eyelid squeezing in the immediate postoperative period in patients with topical anaesthesia could promote transient wound gapes remains to be answered. All our cases of endophthalmitis had topical anaesthesia.

In this study, all five cases of endophthalmitis occurred between June 2001 and September 2002. As this was an unusually high incidence of endophthalmitis in a short period of time, many surgical aspects were analysed. No cause from the operating room itself was identified. Before April 2000, all cases carried out by this single surgeon were performed using a sutured superior scleral tunnel incision using neither povidone iodine at closure, nor antibiotic drops in the first 24 h of surgery. After conversion to clear corneal temporal incisions, neither the povidone iodine nor the antibiotic routine was changed. Only secure wounds were left unsutured. After the fourth case of endophthalmitis, however, the surgical protocol was amended to routinely include povidone iodine at closure. After the fifth case, antibiotic drops were given in the first 24 h of surgery. After September 2003, all incisions were routinely sutured. None of the five cases of endophthalmitis had a wound leak on the first postoperative day. It is possible that a transient period of hypotony during the first 24 h could have allowed the inflow of non-sterile ocular surface fluid into the eye despite a secure wound at the immediate conclusion of surgery.

As this is a relatively small retrospective study, we cannot delineate which of the three factors is most important in preventing postoperative infection. Nevertheless, this study strongly suggests that whether or not the ocular surface is pharmacologically sterilised preoperatively, the optimal protection against endophthalmitis could be wound closure with a suture and initiation of antibiotic treatment within the first 24 h of surgery. Application of povidone iodine at closure may also have some protective effect.

Table 2 Perioperative information on patients with endophthalmitis

Case no	Suture	Antibiotics afternoon of surgery	Povidone iodine before surgery	Povidone iodine after surgery
1	No	No	Yes	No
2	No	No	Yes	No
3	No	No	Yes	No
4	No	No	Yes	No
5	No	No	Yes	Yes

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